

An Assessment of Good Current Practices For Recycling of Hazardous Secondary Materials

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**U.S. Environmental Protection Agency
Office of Solid Waste**

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I Introduction

The U.S. Environmental Protection Agency (EPA) conducted this study as part of its effort to revise the current definition of “solid waste” under the Resource Conservation and Recovery Act (RCRA). Under the definition of solid waste in RCRA, some hazardous secondary materials that are recycled are regulated as wastes, while other such materials are not regulated. EPA anticipates that this study, along with other studies conducted in support of this rulemaking initiative, will help to inform the Agency's regulatory decision process.

Background

On October 28, 2003, EPA published a proposal in the *Federal Register* to revise the definition of solid waste in the regulations that implement Subtitle C of RCRA. After reviewing the comments that were submitted on that proposal, the Agency decided to pursue a different regulatory approach, and in addition, to conduct several studies to examine certain key issues associated with the hazardous secondary materials recycling industry. As part of that effort, this study documents current recycling practices that are intended to ensure that the recycling of hazardous secondary materials—whether regulated under RCRA or not—is done in a safe, legitimate manner.

The recycling of hazardous secondary materials is, for the most part, a well-established and mature industrial practice in an industry that in some cases is heavily regulated. The phrase “hazardous secondary material” covers a variety of regulated and non-regulated materials from many different industries that must be stored and managed differently. EPA believes that responsible companies managing these materials generally operate in an environmentally conscientious manner.

In EPA's recent discussions with generators and recyclers of hazardous secondary materials, we have consistently heard assertions that recycling practices have changed substantially since the passage of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)—also known as Superfund—and the promulgation of the RCRA hazardous waste regulatory system, both of which happened in 1980.¹ Thus, industry representatives maintain that recycling of hazardous secondary materials under the current regulatory and liability regime is conducted in a much more environmentally sound manner than thirty years ago, and that many generators and recyclers make concerted efforts to ensure that they comply with their RCRA and CERCLA obligations and practice good stewardship. It is these current good recycling practices that the Agency is interested in assessing and documenting as part of this study.

The study attempts to assess the incentives associated with good recycling practices and documents specific practices used in the responsible management of hazardous secondary materials. The study then examines some of the resources available to generators to assist in decisions about recycling these materials and concludes with a

¹ Another EPA study in support of this rulemaking examines cases where environmental problems occurred due to recycling since the passage of RCRA and CERCLA.

case study of the electronics industry's approach toward management of potentially hazardous electronics waste.

This report does not present an exhaustive analysis of responsible recycling practices and is not representative of every facility or company in the industry that is responsibly recycling. Thus, it is likely that there are approaches being used that are not captured within this study. EPA is requesting comments from stakeholders on the contents of this study, particularly on specific responsible recycling practices that are not reflected in it and on the conclusions reached as a result of the information collected.

Scope of Study

The goal of this study is to identify existing practices for recycling of hazardous secondary materials that minimize or prevent releases of hazardous constituents into the environment and to examine, in general terms, the incentives associated with such practices. The study primarily focuses on industrial recycling of hazardous secondary materials, whether that recycling is regulated under Subtitle C of RCRA or not. In addition, the study uses some examples of industrial recycling of materials that are not regulated as hazardous waste or, as in the case of electronics, materials that can sometimes be hazardous depending on the design of their components.

The study also includes some discussion of management practices that do not involve recycling (e.g., incineration and landfill disposal). This is because, in many cases, generators' liability concerns regarding mismanagement of their hazardous secondary materials are the same whether those materials are being treated and disposed of or are being recycled. Responsible generators often take the same precautions and manage hazardous secondary materials the same way in both situations. For this reason, EPA decided that examples from both hazardous secondary materials recycling and from conventional treatment and disposal can be useful for illustrating general good management practices. In addition, because of the increasing global nature of American manufacturing, we have included discussion of international recycling practices that are relevant to the scope of the study to supplement discussion of U.S. trends.

Methodology

In conducting this qualitative study, we used several different research techniques, including literature searches of trade magazines and journals, examination of publicly available papers presented at conferences, and review of Web sites of specific states, companies, trade associations, and other organizations. Internet searches were fairly broad in nature to capture relevant information or examples that may not have been originally considered part of the scope of the study. We conducted telephone interviews with representatives from selected companies that were known to have substantial recycling operations, or that otherwise represented themselves (e.g., in comments submitted on the 2003 regulatory proposal) as being engaged in responsible recycling of hazardous secondary materials. We also interviewed representatives from several trade associations whose member companies were known by the Agency to have substantial

involvement in recycling of hazardous secondary materials. Information gathered from these varied sources was reviewed and combined into this overview of recycling practices designed to be responsible. A listing of sources used is available at the end of the study.

As stated earlier, it should be noted that this study is not an exhaustive examination of all the responsible practices in the field of hazardous secondary materials management, nor of the companies and organizations employing them. For example, many of EPA's contacts came from the public comments submitted to the 2003 proposed rule from interested stakeholders. EPA recognizes that many of the sources for this study are larger companies with extensive Web presences or with environmental and legal staff well-versed in state and federal environmental programs. Although we consistently sought information on and questioned interviewees on the practices of smaller companies, we nonetheless believe that these companies might be under-represented in the study.

Despite the limitations of the study, EPA believes that many of the practices discussed in this report are relatively common among responsible handlers of hazardous secondary materials. We welcome comments from the public on this aspect of the study, as well as on the contents of this study in general. In particular, we are interested in examples of responsible recycling practices that are not documented in the study, further information on practices that are described in the study, and any rebuttals of EPA's findings.

In addition, EPA would like to caution that the mention of a company name, trade name, product, or service in this study is not an endorsement of any kind. Although we have good faith that the practices described to us and discussed in this study are in fact in use in industrial processes as they are described, the study is primarily based upon each individual organization's self-characterization of its standard processes and practices. EPA was not able to verify whether or how companies implement the described practices. EPA also did not check the compliance histories of the companies it used as sources for this study. The Agency understands that the practices discussed in this study may not prevent every release of regulated materials to the environment and has not conducted separate analyses of their effectiveness. However, the relevant sectors of industry have designed these practices to minimize releases and the Agency believes that they are important steps toward responsible and complete management of materials.

II Current Incentives for Responsible Recycling

With regard to incentives that encourage corporations to recycle hazardous secondary materials in a responsible manner, those interviewed for this study consistently cited the liability provisions of CERCLA and analogous state authorities as being of primary importance. Besides concern for potential Superfund liability, public interest in environmental impacts of corporate behavior is also an incentive that was cited for responsible recycling. The public's expectations about corporate responsibility for minimizing the environmental hazards stemming from its processes and products have

changed in recent years and evolving expectations lead to stronger corporate environmental policies, increased public relations activities, and the adoption of environmental management systems (EMSs). These measures may lead waste generators to monitor more closely what happens to their materials after they travel off site.

One of the reasons most cited for managing hazardous secondary materials responsibly appears to be the CERCLA provisions establishing liability. Most companies that have developed auditing programs for their secondary materials have done so in response to the 1980 CERCLA legislation. Audit programs can help them ensure that their materials are not mishandled and thereby minimize risk of future liability under Superfund.

The 1980 CERCLA legislation creating the Superfund program responded to public outcry during the 1970s about public exposure to dangerous chemicals at uncontrolled hazardous waste sites such as Love Canal in Niagara Falls, New York. Among other things, CERCLA gave the federal government authority to respond to hazardous substance emergencies and to force those responsible for the contamination to either clean up the releases or pay for a clean up.² The CERCLA legislation made persons who arrange for the disposal of a hazardous substance liable for future environmental cleanup costs if the later management of the hazardous substance results in environmental damages.

For those generators of hazardous secondary materials with auditing programs, the most important incentive from CERCLA is likely that it imposes strict, joint and several, and retroactive liability. Under the statute, those responsible for the contamination—known under CERCLA as “responsible parties” or “potentially responsible parties”—can be found liable without regard to negligence or fault (“strict liability”) and, if other potentially responsible parties cannot be found, can be liable for the entire cost of the site cleanup (“joint and several liability”).³ Retroactive liability means that an organization can also be held liable even if no law was broken at the time a material was disposed or released. Therefore, under Superfund, a generator sending hazardous secondary materials to a recycler or waste disposal facility that mishandles it can, years later, be found liable for their cleanup and any damage caused by them. The generator can also be found liable for cleanup of and damage from other generators’ materials at this same site. If the facility operators cannot be identified or located, the generator can be held liable for the entire site cleanup.

The results of this study describe how some generators have found that conducting an audit to determine a vendor’s financial health, insurance coverage, and

² United States Environmental Protection Agency, *CERCLA/Superfund Orientation Manual*, Document number: EPA/542/R-92/005, October 1992.

³ United States Environmental Protection Agency, *CERCLA/Superfund Orientation Manual*, Document number: EPA/542/R-92/005, October 1992.

waste management measures is a wise business practice when CERCLA liability is a consideration.⁴

Waste generators and recyclers attested to the importance of avoiding the creation of another Superfund site and limiting their CERCLA liability as key to the development of company audit programs.⁵ An example is CHWMEG, Inc., a non-profit trade association started in 1985 and made up of companies seeking to audit the vendors managing their waste. A current representative told EPA that the founding members of the association believed they should be more careful about which waste handlers they were using because they were concerned about liability under CERCLA.⁶ CHWMEG is discussed later in this study.

Companies have found that there are additional benefits from implementing the practices discussed in this study. In response to public interest in the environmental performance of companies, many have developed programs encouraging corporate environmental stewardship. In many cases, corporations are also conducting public relations to make their customers aware of their commitments to the environment and the actions they are taking to comply with regulations or to move beyond compliance.

As an example of the varied benefits provided by due diligence, representatives of DuPont told EPA that they started auditing waste vendors as a reaction to Superfund legislation, but that today auditing is considered part of the company's "commitment to corporate stewardship."⁷ Likewise, General Electric stated that their decision to recycle is based on more than saving money by buying fewer raw materials and that they would sometimes recycle despite higher costs because they believe it is better to reuse or reclaim materials than to dispose of them.⁸ General Electric also includes discussion of its in-house auditing program on the "Citizenship" section of its Web site, publicizing it broadly.⁹ Displaying environmental accomplishments in a prominent place on the company's Web site shows that the environment is an active concern of that company's communications strategy.

⁴ An amendment to CERCLA, the Superfund Recycling Equity Act (SREA), passed in 1999 gives some protections from liability to generators who send certain materials for recycling, but includes several requirements, including the following: the recyclable material must meet a commercial specification grade; there must be a market for the recycled product; a substantial portion of the recyclable material must be made available as a feedstock for making a new product; the recyclable material or recycled product must be able to be a replacement or substitute for a virgin raw material; and the person arranging the transaction must have exercised reasonable care to determine that the receiving facility was in compliance with applicable federal, state, and local laws (SS). This act provides relief to generators of a number of scrap materials, including scrap paper, scrap plastic, scrap glass, scrap textiles, scrap rubber, scrap metal, and scrap batteries but, due to its scope, does not widely affect hazardous secondary materials recycling.

⁵ General Electric, Conference call with EPA Office of Solid Waste, November 21, 2005, and Safety Kleen, Conference call with EPA Office of Solid Waste, January 31, 2006.

⁶ CHWMEG, Inc., Conference call with EPA Office of Solid Waste, November 17, 2005.

⁷ Dupont, Conference call with EPA Office of Solid Waste, December 20, 2005.

⁸ Bob Scarberry, General Electric, email to staff of EPA Office of Solid Waste, December 1, 2005.

⁹ General Electric, "Environment, Health, and Safety," General Electric web site, <http://www.ge.com/en/citizenship/ehs/index.htm>.

Another incentive for generators to implement responsible practices results from the recent trend toward systemizing environmental performance. A company may choose to start implementing new responsible practices as part of developing an environmental management system (EMS) or in order to get certified for an EMS under the international ISO 14001 standard.¹⁰ Having an EMS can be a selling point for a company to differentiate it from its competitors,¹¹ but such a system requires careful scrutiny of all of the facility's operations. An EMS requires identification of all parts of the operation that may affect the environment, including downstream impacts. Therefore, developing an EMS could raise the company's awareness about the potential damage its waste could cause if mismanaged, leading to institution of an auditing program or other responsible practices.

Other practices come from initiatives and regulations in other countries that affect multinational corporations. One example is a 2004 European Union (EU) environmental liability directive with some similarities to CERCLA in the United States, but with a broader scope in several ways. The directive includes damage to endangered species and natural habitats and damage to the land due to introduction of organisms and genetically modified organisms.¹² The EU directive also assigns liability to a company when there is an imminent threat of damage.¹³ Although there are some liability limitations in the directive—for example it does not make an operator liable for activities that were not considered harmful at the time they happened—this directive could lead companies located in both the United States and Europe to look again at their waste and what happens to it once it leaves the generating facility.

Generator responsibility for a waste through its lifecycle is part of both CERCLA and RCRA regulatory schemes. Because the main concern about mismanagement of recyclable hazardous secondary materials is that they may end up uncontrolled in the environment, management is always a concern for generators. Regardless of whether their concerns stem from knowledge of potential liability under CERCLA or another regulatory requirement, either in the U.S. or abroad; from corporate values of stewardship and environmental responsibility; from concerns about public relations; or from the desire to become ISO 14001-certified for an environmental management system, responsible companies and corporations are doing their best to make sure the waste vendors implement responsible practices for careful and appropriate waste treatment, disposal, and recycling.

¹⁰ CHWMEG, Inc., Conference call with EPA Office of Solid Waste, November 17, 2005, and Heritage Environmental Service, Conference call with EPA Office of Solid Waste, January 20, 2006.

¹¹ Gage Products, Conference call with EPA Office of Solid Waste, January 11, 2006.

¹² Battelle Science and Technology International, "The New European Union Liability Directive—Impact on Due Diligence Assessments," Battelle web site, <http://www.battelle.org/Environment/publications/EnvUpdates/summer2004/article6.stm>

¹³ Environmental Data Services, Ltd. "A New Era for Corporate Liability?" ENDSDirectory web site. <http://www.endsdirectory.com/index.cfm?action=articles.view&articleID=200404>.

III Recycling and Waste Management Practices to Mitigate Environmental Risks

This study found that in the hazardous secondary materials industry, responsible generators—whether their materials are regulated as waste or not—and recyclers of these materials often use certain standard practices to minimize the chance of an accidental release of hazardous constituents. The generators and recyclers interviewed for this study expressed pride in the systems their companies had built to ensure responsible management throughout the chain of ownership.

Practices that generators and other handlers of hazardous secondary materials use to protect themselves from Superfund liability or bad publicity for directly or indirectly causing environmental damage fall into two general categories. The first discussed here is environmental auditing, a form of environmental due diligence during which a series of inquiries is used to determine whether the entity to which a generator sends its materials is equipped to responsibly manage those materials without the risk of releases or other environmental damage. The other general category includes the actual practices that each party in the transaction uses to increase its control over any given shipment of hazardous secondary materials to the outside party managing it for disposal or recycling—often known as a “third-party vendor.” These practices include the particulars of contracts under which the transaction takes place, such as the material specifications and sampling timetables to be met and the tracking systems in place to let a generator know that its hazardous secondary material has been properly managed.

Facility Auditing

Based on our discussions with manufacturers and vendors, EPA believes that responsible large companies that generate waste to be sent off site for management, as well as responsible small- or medium-size companies, are auditing the third-party vendors that manage secondary materials from their facilities. Audits provide generators of secondary materials with a way to learn the nature of the processes at the facilities to which they send materials so they can evaluate the likelihood of future releases from those facilities into the environment. Audits are considered part of the due diligence needed to prevent future Superfund liability from mismanaged materials and to maintain public images of corporate responsibility.

Environmental audits can take many forms and can be of varying levels of complexity. Companies that manage secondary materials, particularly hazardous secondary materials, are often regularly audited by the generators of those materials.¹⁴ Although not all generators have the resources to hire in-house staff or outside consultants to perform audits, there are organizations and consortiums that assist those

¹⁴ Pacific Gas and Electric Corporation, “Our Environment,” Pacific Gas and Electric web site, http://www.pgecorp.com/corp_responsibility/reports/2003/env_continuing.html; Conference calls with EPA Office of Solid Waste: Clean Harbors Environmental Services, January 11, 2006; DuPont, December 20, 2005; Ford Motor Company, December 8, 2005; Gage Products, January 11, 2006; General Electric, November 21, 2005; Heritage Environmental Services, January 20, 2006

companies in ensuring that the materials they are disposing or sending for recycling will be properly managed.

Although this study focuses on recycling of hazardous secondary materials, EPA found that in many cases the same precautions are being taken whether the materials are being recycled or disposed. Therefore, to provide a more thorough picture of how auditing works in this context, this section discusses auditing by both recyclers and disposers of hazardous secondary materials. Each company manages its waste program differently, but some auditing trends were evident in the descriptions of audit procedures that are available publicly and in our conversations with environmental representatives of companies that generate waste and of those that manage it. For example, each company performing an audit has its own processes and procedures, but there are some topics that those interviewed for this study consistently cited as important when auditing a waste vendor, such as—

- Site history, ownership history, and previous activity and/or contamination at that site;
- History of environmental compliance and history of any spills indoors or outside;
- Compliance with all required permits;
- General housekeeping at the facility;
- Waste screening and acceptance procedures;
- Description of process design and capability;
- Residuals management;
- Financial soundness;
- Possession of adequate pollution liability insurance and general insurance; and
- Provisions for any necessary closure and cleanup costs if closure/ post-closure are suddenly necessary.¹⁵

A more thorough list of subjects that can be covered by a typical due diligence vendor audit is available in Appendix A.

¹⁵ Sources for the items in this list: Heritage Environmental Services, “Customer Audit Handbook,” July 2005; New England Waste Management Officials Association, “How to Recycle Mercury in 8 Easy Steps,” NEWMOA web site, http://www.newmoa.org/Newmoa/htdocs/prevention/mercury/lamprecycle/how_to_brochure.pdf; Bob Scarberry and Michele Anders, “Waste Management Facility Audits: The General Electric Experience and OECD Guidelines,” Presentation at OECD Workshop on the Environmentally Sound Management of Recoverable Wastes (ESM), Cancun, Mexico, October 28-29, 1999; Trans-Cycle Industries, “Recycling Facility Audit Guidelines,” Trans-Cycle Industries web site, <http://www.tci-pcb.com/audit.htm>; Washington State Department of Ecology, “How to Choose a Hazardous Waste or Used Oil Contractor—A Help Guide: Sample Checklist for Evaluation Costs, Services, Liability, and Compliance,” Washington State Department of Ecology web site, http://www.ecy.wa.gov/programs/hwtr/hwfacilities/web_guide/checklist.html; Western Canadian Auditing Roundtable, “Waste Facility Environmental Review: New Version 3,” Western Canadian Auditing Roundtable web site, <http://www.wcar.org/Framesets/ResourcesFrameset.htm>; Conference calls with EPA Office of Solid Waste: CHWMEG, Inc., November 17, 2005; Clean Harbors Environmental Services, January 11, 2006; DuPont, December 20, 2005; Gage Products, January 11, 2006; Heritage Environmental Services, January 20, 2006; Safety-Kleen, January 31, 2006; United Technologies, February 6, 2006.

Audits differ depending on the auditor, but the main elements are standard enough that entities being audited can anticipate most of the information requested. In many cases, recyclers send materials covering all relevant topics, in advance, to potential customers. For example, Heritage Environmental Services has developed their Crystal Clean's Customer Audit Handbook that can be sent to a customer in advance. The information in it can later be verified with a site visit.

Although many audits cover the topics discussed above and, usually, many more, such as those in Appendix A, a generator's requirements for the companies it does business with are not standard. Each generator must make its own decision about what management practices it requires from the vendor managing its materials and whether the recycler or disposer being audited adequately meets those requirements.¹⁶

Most items on the above list of audit elements are self-explanatory, but possession of adequate pollution liability insurance merits some additional discussion. A recycler's possession of environmental insurance is a valuable indicator to a generator of the recycler's ability to financially cover accidents, damage, and costs for closing a facility. In addition, insurers usually audit a facility before issuing an insurance policy, adding more confidence for generators about a recycler's financial and operating health.

Recyclers of hazardous secondary materials that have RCRA permits are currently required to provide financial assurance for closure and may be required to have financial assurance for cleanup (corrective action) costs. These mechanisms were established to make sure that adequate finances are available in case a company enters bankruptcy or the owner cannot be located to pay for a site clean-up or a facility's closure. Financial assurance for closure also ensures that the costs of closure will be covered when closure becomes necessary. Insurance is one accepted form of financial assurance, although it is not as commonly used as other mechanisms. Permitted recyclers that are required to have closure plans also have to meet certain RCRA minimum requirements for third party liability coverage: \$1 million per occurrence and \$2 million annual aggregate for sudden accidental occurrences; \$3 million per occurrence and \$6 million aggregate for non-sudden accidental occurrences. However, many unpermitted recyclers are not subject to RCRA permit requirements and, thus, are not required to have financial assurance.

Still, responsible recyclers opt to buy insurance policies on their own or buy policies that exceed the established RCRA insurance minimums. This practice seems due in large part to generators' expectations that recyclers will have insurance to handle accidental liability resulting from recycling activities. During recycling audits, adequate insurance coverage is considered important when evaluating a recycler's overall financial health. Generators are interested in general liability, comprehensive liability, auto liability, pollution liability, and worker compensation insurances.¹⁷ We learned that the general range of total insurance coverage that generators prefer third-party vendors to

¹⁶ United Technologies, Conference call with EPA Office of Solid Waste, February 6, 2006.

¹⁷ Gage Products, Conference call with EPA Office of Solid Waste, January 11, 2006.

have can start at the RCRA required minimum for third party liability and be as high as \$17 million, if not higher.¹⁸

In addition to adequate insurance coverage, generators conducting audits look for other types of specific audit findings. An audit can turn up information about a facility's good practices or can give the generator reviewing the audit reasons to be concerned that sending materials there may not result in sound management. Some potential red flags for generators that were mentioned in interviews are—

- any recent explosions or emergencies at the vendor's facility;
- enforcement actions against the facility;
- practices that have deteriorated since a previous audit;
- financial difficulties, Chapter 11 filing, or insufficient insurance coverage; and
- facilities that do not want to discuss their financials with the auditor.¹⁹

Faced with any of these red flags, the auditing generator may choose not to do business with the vendor or may investigate further. In the case of further investigation, the generator sometimes decides to temporarily stop sending shipments to that vendor until the situation is fully understood. A generator that sends hazardous secondary materials to several vendors that can all handle the same kind of material can avoid any delays in managing that material in the case of a problem with any one vendor.²⁰

Although the design of each company's auditing process—what they look for and how they request it—is unique, the information we obtained indicates that most audits appear to have two components.²¹ The first component is a remote screening phase during which the auditing company may look into a vendor's compliance history and general financial stability,²² the two entities may discuss contracts and questions of indemnification,²³ and/or the auditor may ask the vendor to fill out a questionnaire about its operations and facility. This remote screening process can reveal potential problems at a facility, can give the auditors a good sense of what they will see when they visit the facility, and can screen out some vendors from consideration early in the process.²⁴

The second part of the audit typically involves a site visit to the vendor's facility. Depending on the facility and how thorough the audit is, this site visit can take anywhere

¹⁸ Heritage Environmental Services, Conference call with EPA Office of Solid Waste, January 20, 2006.

¹⁹ CHWMEG, Inc., Conference call with EPA Office of Solid Waste, November 17, 2005; DuPont, Conference call with EPA Office of Solid Waste, December 20, 2005; General Electric, Conference call with EPA Office of Solid Waste, November 21, 2005.

²⁰ Dupont, Conference call with EPA Office of Solid Waste, December 20, 2005.

²¹ Clean Harbors Environmental Services, Conference call with EPA Office of Solid Waste, January 11, 2006; Safety-Kleen, Conference call with EPA Office of Solid Waste, January 31, 2006; Trans-Cycle Industries, "Recycling Facility Audit Guidelines," Trans-Cycle Industries web site. <http://www.tci-pcb.com/audit.htm>.

²² Trans-Cycle Industries, "Recycling Facility Audit Guidelines," Trans-Cycle Industries web site, <http://www.tci-pcb.com/audit.htm>.

²³ Heritage Environmental Services, Conference call with EPA Office of Solid Waste, January 20, 2006.

²⁴ Heritage Environmental Services, Conference call with EPA Office of Solid Waste, January 20, 2006.

from a couple of hours to several days. Many audit procedures include the use of a checklist of questions related to company and facility history and operations and particularly focused on materials management processes. Like audit processes, checklists vary depending on the organization conducting the audit: they can be basic, at eight to ten pages, or much longer and more thorough. As an example of what a checklist might look like, the Western Canada Auditing Roundtable (WCAR) has available on its Web site a copy of its audit checklist that is seventy pages long and is accompanied by thirty pages of guidance.²⁵ Although it is from a Canadian organization, this easily accessible and publicly available document is similar to many checklists used for the same purpose in the U.S.

In addition to initial audits, companies often perform repeat audits on a regular schedule. Although the exact period of time between audits can vary depending on factors such as the nature and complexity of the vendor's operations, the relationship between the two companies, or the generator's access to audits performed by trade groups or consortiums, reaudits are usually performed every one to five years.²⁶ In general, generators with systemized waste management programs stressed regular reauditing as a crucial piece of the program.²⁷ As a result of generator auditing strategies, several waste vendors mentioned that they sometimes are audited several times in a week and 100 to 150 times in a year.²⁸

Among those generators auditing third-party waste vendors, some have in-house auditing programs, whereas others belong to organizations through which they can pool resources to make auditing more affordable. Big corporations producing large amounts of waste at multiple sites or using multiple vendors for disposal or recycling may have in-house programs for auditing and evaluating those taking their waste. An in-house program can mean that the corporation's environmental, health, and safety (EH&S) staff are conducting the audits or that the company has a contract with specialists who conduct the audits and bring their findings back for evaluation. Although an in-house program would be more expensive than some of the consortiums discussed below, it does guarantee more control over the entire process.

As an example, General Electric has publicized information about its in-house auditing program. Its waste program is called the Waste Site Qualification Program (WSQP) and was started in the 1980s.²⁹ Its stated purpose is to review waste management sites and, through a detailed on-site environmental audit and an assessment of the

²⁵ Western Canadian Auditing Roundtable, Internet Home Page.

<http://www.wcar.org/Framesets/WFERFrameset>.

²⁶ Clean Harbors Environmental Services, Conference call with EPA Office of Solid Waste, January 11, 2006; DuPont, Conference call with EPA Office of Solid Waste, December 20, 2005; Gage Products, Conference call with EPA Office of Solid Waste, January 11, 2006.

²⁷ Clean Harbors Environmental Services, Conference call with EPA Office of Solid Waste, January 11, 2006; DuPont, Conference call with EPA Office of Solid Waste, December 20, 2005.

²⁸ Gage Products, Conference call with EPA Office of Solid Waste, January 11, 2006; Heritage Environmental Services, Conference call with EPA Office of Solid Waste, January 20, 2006; Safety-Kleen, Conference call with EPA Office of Solid Waste, January 31, 2006.

²⁹ General Electric, Conference call with EPA Office of Solid Waste, November 21, 2005.

vendor's financial standing, to determine if they meet GE's standards.³⁰ The program reevaluates vendors currently in use by General Electric, as well as new vendors, particularly when General Electric acquires a facility that already has a relationship with a waste vendor.³¹

Other examples of companies that have internal audit programs for their waste vendors include DuPont; PinnacleWest, an energy company based in Phoenix that also belongs to two consortiums; Gage Products, a supplier of paint solvents and other materials to manufacturers; and Safety-Kleen, Heritage-Crystal Clean, Clean Harbors, and United Technologies—recycling vendors that, in turn, audit those facilities to which they send residuals from their recycling processes.³² Other companies may have in-house auditing programs that are not as well-publicized as the examples here or have auditing programs that are a combination of audits done in-house and those done by others.

An alternative auditing method that is gaining in popularity among companies is membership to a consortium auditing program that performs audits on vendors that all or many of the members contract with. Because of the time and personnel required to perform an in-depth audit, it can cost several thousand dollars to complete one (most estimates we received ran from \$2,000 to about \$8,000 per audit).³³ Membership in a consortium can defray that cost. This discussion examines several of these consortiums, based both in the U.S. and abroad—in the United Kingdom and Canada—to determine how different organizations work.

Generally, consortiums appear to be an efficient way to disseminate the information gathered during an audit to multiple generators. An important feature of these associations is that they do not certify or qualify a waste vendor as having adequate practices or financial health, nor do they judge whether a generator should or should not use a certain vendor. Generators must still develop their own standards for vendors to meet.³⁴ Judgments about a waste vendor will depend on various factors, such as the type

³⁰ Bob Scarberry and Michele Anders, "Waste Management Facility Audits: The General Electric Experience and OECD Guidelines," Presentation at OECD Workshop on the Environmentally Sound Management of Recoverable Wastes (ESM), Cancun, Mexico, October 1999.

³¹ General Electric, Conference call with EPA Office of Solid Waste, November 21, 2005.

³² Heritage Environmental Services, "Summary of Third Party Program;" Pinnacle West Capital Corporation, "Environmental, Health & Safety." Pinnacle West web site, <http://www.pinnaclewest.com/main/pnw/AboutUs/commitments/ehs/2002/policies/audits/default.html>; Pinnacle West Capital Corporation, "About Us: Company Overview," Pinnacle West web site, <http://www.pinnaclewest.com/main/pnw/AboutUs/overview/default.html>; Conference calls with Office of Solid Waste: Clean Harbors Environmental Services, January 11, 2006; DuPont, December 20, 2005; Gage Products, January 11, 2006; Safety-Kleen, January 31, 2006; United Technologies, February 6, 2006.

³³ Heritage Environmental Services, Conference call with EPA Office of Solid Waste, January 20, 2006; Safety-Kleen, Conference call with EPA Office of Solid Waste, January 31, 2006.

³⁴ Bob Scarberry and Michele Anders, "Waste Management Facility Audits: The General Electric Experience and OECD Guidelines," Presentation at OECD Workshop on the Environmentally Sound Management of Recoverable Wastes (ESM), Cancun, Mexico, October 1999.

of materials managed, the nature of any problems the generator has had in the past with third-party vendors, and the generating company's willingness to take risks.³⁵

The most commonly cited organization in the materials we examined and among those interviewed for this study was CHWMEG (pronounced "chew-meg"). Incorporated in 1995, CHWMEG describes itself as "a non-profit trade association comprised of manufacturing and other 'industrial' companies interested in efficiently managing the waste management aspects of their environmental stewardship programs."³⁶ The organization is designed to allow members to pool their funds, which CHWMEG then uses to conduct audits. CHWMEG also conducts member meetings to share information on auditing.

Every year the association members decide which waste vendors CHWMEG will audit. Once the audits are complete, all members have the right to buy the reports containing the information collected in that audit.³⁷ No waste or recycling vendors can become members of CHWMEG. In 2005, CHWMEG conducted audits of more than 225 waste and recycling facilities. The fee for annual membership to CHWMEG is \$2,200 and each waste report typically costs an additional \$600 to \$850.³⁸ According to the association, if a company generates hazardous secondary materials and sends those materials to three or more facilities, membership will pay for itself just in audit savings.³⁹

CHWMEG manages the audit information that it gathers for its members, but it is not a certification program.⁴⁰ The audit reports evaluate risk in ten areas and provide quantitative risk scores for environmental, operational, and financial risk, but they do not pass or fail a facility or recommend whether or not the members should send waste to the facility. CHWMEG members must use the information in the reports to determine whether the vendor actually meets their particular standards for handling waste and to decide whether or not to use a certain vendor.⁴¹

Since incorporation in 1995, CHWMEG has completed over 1,000 audits of at least 540 facilities, often reauditing facilities, and has grown substantially in membership. In 1996, its first full year, the association had twenty-three members. Ten years later, in 2005, it had one hundred fifty-five members and one hundred eighty-six affiliates. With its growing membership, CHWMEG's annual membership fees have also declined from

³⁵ Bob Scarberry and Michele Anders, "Waste Management Facility Audits: The General Electric Experience and OECD Guidelines," Presentation at OECD Workshop on the Environmentally Sound Management of Recoverable Wastes (ESM), Cancun, Mexico, October 1999.

³⁶ CHWMEG, Inc., "About CHWMEG, Inc.," CHWMEG web site, <http://www.chwmeg.org/html/about.html>.

³⁷ United States Environmental Protection Agency, "Existing Standards and Facility Evaluation Programs Related to E-Waste Recyclers," by Robert Tonetti, Presentation at International Electronics Recycling Institute meeting, October, 2005.

³⁸ CHWMEG, Inc., Internet Home Page, <http://www.chwmeg.org>

³⁹ CHWMEG, Inc., Conference call with EPA Office of Solid Waste, November 17, 2005.

⁴⁰ United States Environmental Protection Agency, "Existing Standards and Facility Evaluation Programs Related to E-Waste Recyclers," by Robert Tonetti, Presentation at International Electronics Recycling Institute meeting, October, 2005.

⁴¹ CHWMEG, Inc., Conference call with EPA Office of Solid Waste, November 17, 2005.

\$5,500 in 1995 to \$2,200 in 2005.⁴² In addition, as membership has grown, more and more of the members are smaller entities. The association told EPA that its founding members were big corporations, but that it is now very affordable for small- and medium-sized companies.⁴³

Although there are other large auditing organizations like CHWMEG in Canada and the United Kingdom, discussed briefly below, this study identified just one other example of a U.S.-based organization, the Joint Utility Vendor Auditing Consortium (JUVAC). JUVAC is a collection of eight California and Arizona electric utility companies that was founded in 1993 to conduct audits of environmental service vendors.⁴⁴ By organizing into a consortium and sharing information, members can more easily choose to contract only with third-party vendors for which they have audit information. The types of vendors audited include landfills, incinerators, electronics recyclers, mercury recyclers, and hazardous waste oil reprocessors.⁴⁵ Of the nineteen vendor audits that JUVAC conducted in 2002, eighty-nine percent were waste treatment, storage, and disposal facilities and eleven percent were recycling firms.⁴⁶

Unlike CHWMEG, a trade association, JUVAC relies on its members to perform the vendor audits and share the information with the other consortium members. To retain active status in the organization, a member must attend two meetings per year and must participate in two audits every year, leading one and assisting with another.⁴⁷ Because the JUVAC members are all from the same industry and, presumably, are managing similar wastestreams, this organizational structure may be more effective for streamlining their audit costs than an association like CHWMEG, which has members with more diverse wastestreams.

A brief look at two large foreign audit organizations illustrates two points: waste vendor audits are an international occurrence and foreign companies are also in the market for ways to share the expenses of waste audits. The Waste Facilities Audit Association (WFAA), founded in 1993, is an organization based in the United Kingdom (UK) and has about thirty members from corporations in Europe and America.⁴⁸ WFAA's Web site declares that it was formed in response to "tightening legal environmental requirements, increased cost of waste disposal, and increased public and corporate expectation."⁴⁹ Like CHWMEG, members have access to audit reports that

⁴² CHWMEG, Inc., "Organizational Trends," CHWMEG web site, <http://www.chwmeg.org/html/trends.html>.

⁴³ CHWMEG, Inc., Conference call with EPA Office of Solid Waste, November 17, 2005.

⁴⁴ Joint Utility Vendor Audit Consortium, "What is JUVAC?" Joint Utility Vendor Audit Consortium web site, <http://www.juvac.org/pages/1/index.htm>.

⁴⁵ Joint Utility Vendor Audit Consortium, "What is JUVAC?" Joint Utility Vendor Audit Consortium web site, <http://www.juvac.org/pages/1/index.htm>.

⁴⁶ Pinnacle West Capital Corporation, "Environmental, Health & Safety," Pinnacle West web site, <http://www.pinnaclewest.com/main/pnw/AboutUs/commitments/ehs/2002/policies/audits/default.html>.

⁴⁷ Joint Utility Vendor Audit Consortium, "What is JUVAC?" Joint Utility Vendor Audit Consortium web site, <http://www.juvac.org/pages/1/index.htm>.

⁴⁸ Waste Facilities Audit Association, "Overview of the WFAA," WFAA web site, <http://www.wfaa.net/overview.shtml>.

⁴⁹ Waste Facilities Audit Association, Internet Home Page, <http://www.wfaa.org.uk/>.

WFAA contractors conduct and the audit costs are shared among the members. Full membership in the organization costs £1,200 (approximately \$2260 USD)⁵⁰ and members have the option to pay for access to individual audits.⁵¹

Once a member of WFAA, a company can participate in a regular three-year cycle of audits—called the UK core audit programme—for £1,600 (approximately \$3020 USD) per year. WFAA arranges for thirty major UK waste management facilities to be audited every three years, so for that £1,600, a company gets at least ten audit reports a year.⁵² A new WFAA program, the European core audit programme, is in development and members would be able to nominate facilities that they would like to be audited during the next year. Finally, a member can sponsor additional audits through the association for a flat fee of £2,900 (approximately \$5475 USD), which may be split among other members if they are interested in the report.⁵³

A Canadian program demonstrates a different approach to group audit organizations. The Western Canadian Auditing Roundtable (WCAR), a non-profit organization committed to improving environmental health and safety management systems in western Canada, designed the Waste Facility Environmental Review process (WFER) in 1996 in response to generating companies that were regularly requesting audits of their waste management vendors.⁵⁴ Under WFER, the waste disposal or management facility conducts an audit of its own facilities using a common audit checklist. The information in the audit has to be verified by a qualified outside party who visits the facility and ensures that the information in the report is correct. Requirements for the verifiers include that they must employ environmental auditing principles, must comply with the Canadian Environmental Auditing Association Code of Ethics, and must belong to a professional organization with a procedure for discipline.⁵⁵ A verified audit is valid for three years or until there is a major process change at the facility.⁵⁶

The audit checklist for the WFER program was designed to provide information on compliance management systems and to identify a facility's risk.⁵⁷ The checklist was

⁵⁰ Approximate currency conversions in this section of this study were made on September 20, 2006.

⁵¹ Waste Facilities Audit Association, "Advantages & Costs," WFAA Web site, <http://www.wfaa.net/benefits.shtml>.

⁵² Waste Facilities Audit Association, "Overview of the WFAA," WFAA web site, <http://www.wfaa.net/overview.shtml>.

⁵³ Waste Facilities Audit Association, "Overview of the WFAA," WFAA web site, <http://www.wfaa.net/overview.shtml>.

⁵⁴ Morley Kostecky and Richard Hart, "The Waste Facility Environmental Review Process," Western Canadian Auditing Roundtable web site, <http://www.wcar.org/text/articleEnvironmentalprocess.htm> (originally published in Hazardous Material Management Magazine, February/March 2000).

⁵⁵ Morley Kostecky and Richard Hart, "The Waste Facility Environmental Review Process," Western Canadian Auditing Roundtable web site, <http://www.wcar.org/text/articleEnvironmentalprocess.htm> (originally published in Hazardous Material Management Magazine, February/March 2000).

⁵⁶ Western Canadian Auditing Roundtable, Internet Home Page, <http://www.wcar.org/Framesets/WFERFrameset>.

⁵⁷ Western Canadian Auditing Roundtable, "Guidance Document for Facility Owners, Completers and Verifiers: Version 2," Western Canadian Auditing Roundtable web site, <http://www.wcar.org/Framesets/ResourcesFrameset.htm>.

developed by twelve WCAR members who based it on the existing auditing protocols of the Roundtable members.⁵⁸ Under the program, if the WFER protocol does not exactly meet a generator's information needs, the generator can supplement the information in the standard checklist with extra questions.⁵⁹

Unlike the reports created and owned by CHWMEG and sold only to generators, once the WFAA audit report is complete and verified, the waste management facility owns the reports and can share it with any generator.⁶⁰ The generator can then evaluate the information in the verified audit to determine if it wants to do business with that vendor.⁶¹ Although costs for completing a verified WFER audit report have been reported to range from \$1,500 CAD to \$5,000 CAD (approximately \$1330 USD to \$4435 USD), depending on the facility's complexity, the savings were visible quickly and by early 2000, forty companies had endorsed WFER as their primary risk assessment data source and forty-five WFER audits had been completed.⁶² A Safety-Kleen representative stated that the program had reduced the time needed to prepare audit reports for four to ten generators from five to ten weeks per year to about one week per year.⁶³

In addition to the associations, organizations, and consortiums discussed above, there are commercial entities that offer other services for hazardous secondary materials. Univar's ChemCare® program is an example of a commercial venture where Univar actually takes possession of the materials. Univar advertises that it routinely audits the transporters and TSDFs that it uses for compliance, financial stability, and environmental stewardship.⁶⁴ Under this program, the generator still chooses the receiving facility, but Univar conducts audits, manages the handling and transporting of the materials, and also offers financial indemnification against future liabilities for waste from pick-up to disposal. By design, this kind of service is very different from the auditing assistance providers discussed above. CHWMEG and WFAA, for example, sell information, not waste handling services, and do not offer indemnification.

⁵⁸ Morley Kostecky and Richard Hart, "The Waste Facility Environmental Review Process," Western Canadian Auditing Roundtable web site, <http://www.wcar.org/text/articleEnvironmentalprocess.htm> (originally published in Hazardous Material Management Magazine, February/March 2000).

⁵⁹ Morley Kostecky and Richard Hart, "The Waste Facility Environmental Review Process," Western Canadian Auditing Roundtable web site, <http://www.wcar.org/text/articleEnvironmentalprocess.htm> (originally published in Hazardous Material Management Magazine, February/March 2000).

⁶⁰ Western Canadian Auditing Roundtable, Internet Home Page, <http://www.wcar.org/Framesets/WFERFrameset>.

⁶¹ Western Canadian Auditing Roundtable, Internet Home Page, <http://www.wcar.org/Framesets/WFERFrameset>.

⁶² Morley Kostecky and Richard Hart, "The Waste Facility Environmental Review Process," Western Canadian Auditing Roundtable web site, <http://www.wcar.org/text/articleEnvironmentalprocess.htm> (originally published in Hazardous Material Management Magazine, February/March 2000); Western Canadian Auditing Roundtable, Internet Home Page, <http://www.wcar.org/Framesets/WFERFrameset>.

⁶³ Morley Kostecky and Richard Hart, "The Waste Facility Environmental Review Process," Western Canadian Auditing Roundtable web site, <http://www.wcar.org/text/articleEnvironmentalprocess.htm> (originally published in Hazardous Material Management Magazine, February/March 2000).

⁶⁴ ChemCare Management, "Frequently Asked Questions," ChemCare web site, <http://www.chemcare.com/faq.htm>.

There appear to be a limited number of organizations currently assisting generators in performing due diligence audits on the vendors to whom they send hazardous secondary materials for disposal or recycling. However, the presence of these organizations is well-known to the industry. These organizations and consortiums appear to reduce the price and burden of the audit process for both the generator and for the facility being audited while still providing generators with the information they need to make informed and responsible decisions about who will be managing their hazardous secondary materials.

Although auditing is being practiced by many responsible companies in the handling of their hazardous secondary materials and appears to be growing as a practice, it is not ubiquitous among materials handlers and is significantly less common among generators of non-hazardous waste. The findings of this study show that a segment of the generator universe does not individually audit their waste vendors. One large waste vendor told us that sixty percent of its new large customers and thirty to fifty percent of its new small customers do audits, though the smaller ones may not include a site visit in their audit, instead focusing more on records and public information.⁶⁵ Another recycler stated that, in general, small generators do not audit as regularly as larger customers.⁶⁶

In some cases, the generators not auditing may try to ensure responsible materials management by relying on the good reputation of the vendor they choose.⁶⁷ Alternatively, some of these generators, including small- and medium-sized ones, may be members of a consortium.⁶⁸ It is likely, however, that there are hazardous waste generators or even segments of industry that are not knowledgeable enough about potential Superfund liability to realize the benefits of auditing, that cannot afford to audit, or that are not concerned with auditing or with following up on the fate of their waste or secondary materials.

Likewise, some waste vendors do not get regularly audited, particularly those handling materials not fully regulated under RCRA. For example, General Electric stated that through their Waste Vendor Qualifications Program (WVQP), they audit all vendors to which they send their waste and that, although auditing is common among traditional fully regulated and permitted RCRA facilities, it is not common for facilities recycling waste oil or facilities that recondition drums.⁶⁹ Audits are becoming more common for recyclers of electronics waste, but this is a fairly recent trend discussed in Section V of this study.⁷⁰ Similarly, auditors for the consortium CHWMEG have found that some facilities they visit that manage universal wastes, used electronics, or catalyst for regeneration had never been audited before.⁷¹

⁶⁵ Clean Harbors Environmental Services, Conference call with EPA Office of Solid Waste, January 11, 2006.

⁶⁶ United Technologies, Conference call with EPA Office of Solid Waste, February 6, 2006.

⁶⁷ Heritage Environmental Services, Conference call with EPA Office of Solid Waste, January 20, 2006; Safety-Kleen, Conference call with EPA Office of Solid Waste, January 31, 2006.

⁶⁸ Heritage Environmental Services, Conference call with EPA Office of Solid Waste, January 20, 2006.

⁶⁹ General Electric, Conference call with EPA Office of Solid Waste, November 21, 2005.

⁷⁰ General Electric, Conference call with EPA Office of Solid Waste, November 21, 2005.

⁷¹ CHWMEG, Inc., Conference call with EPA Office of Solid Waste, November 17, 2005.

Audits differ depending on the goals, the size, and the industry of the generator. Individual audit practices and needs may vary based on the type of industry and the method of performing the audit may vary based on whether the generator does its own audits or uses the services of a trade association or consortium. However, the basic elements of an audit are clear. In their audits, generators seek assurance that the facility to which they are sending their hazardous secondary materials is complying with environmental permits and regulations, is capable of managing the materials they receive without releases to the environment, has adequate insurance, and is financially stable.

Practices for Responsible Materials Management

Although auditing is an important element of responsible materials management, there are other practices identified in this study that help reduce risks and assist in ensuring environmentally successful recycling. Material specifications, drop-off and tracking protocols, and certificates of recycling are all means by which generators can increase their control over subsequent management of the hazardous secondary materials they generate.

Recycling and waste contracts specify both the nature of the materials being transferred between companies and the rates the vendor charges to manage those materials.⁷² Specifications for arriving materials that are laid out ahead of time in a contract and sampling procedures that ensure that those specifications are met are environmentally important and effective because they ensure that the third-party vendor knows what materials are arriving on its site and is equipped to manage them well. Specifications are especially important when the vendor is recycling the secondary materials because the materials are acting as an ingredient in a manufacturing process and off-specification ingredients can disrupt that process. Sampling is required to determine if materials meet the set specifications.

For example, Safety-Kleen, a national waste management and recycling company, told us that it will do extensive sampling before entering into a contract with a company that needs solvents to be recycled to ensure that Safety-Kleen will be able to properly manage the waste stream being sent to them. Safety-Kleen also discussed how, when entering a batch tolling agreement in which the generator wants its materials returned for reuse, it must ensure that it is able to meet the generator's specifications.⁷³ We heard of similar early sampling protocols in conversations with other commercial recyclers.

In addition to early sampling, some vendors often sample each shipment when it is delivered. Contracts often contain a clause addressing what happens if a "non-conforming waste," a material that is not specified in the contract, arrives from the generator. This most often results in an additional fee charged to the generator.⁷⁴ The

⁷² Bob Scarberry, General Electric, email to staff of EPA Office of Solid Waste, December 1, 2005.

⁷³ Safety-Kleen, Conference call with EPA Office of Solid Waste, January 31, 2006.

⁷⁴ Heritage Environmental Services, January 20, 2006; Safety-Kleen, Conference call with EPA Office of Solid Waste, January 31, 2006.

additional consequences of a shipment of non-conforming material depend on several variables. If the receiving facility can manage the material, it probably will.⁷⁵ If it doesn't have the capability to manage the material, it may return the material to the original generator or arrange with the generator to have it shipped to another vendor.⁷⁶ Charging fees for non-conforming waste is a way that the vendor can discourage generators from sending it anything not agreed upon in the contract and thereby control what comes into its facility.

Another practice that increases the vendor's control over materials on site is to schedule all the deliveries of hazardous secondary materials from the generators. Transportation arrangements vary and in some cases the vendor facility arranges to pick up materials, thus already doing any scheduling themselves. In other cases, however, the generator either transports the materials itself or arranges for them to be shipped by a third-party transporter.⁷⁷ Scheduled deliveries appear to be common in the secondary materials industry, but are not a standard practice.⁷⁸

Conducting scheduled drop-offs for materials ensures that the vendor facility has the capacity and ability to handle and manage all materials that it has on site at any given time. It also ensures more consistent communication between the generator and the vendor throughout the process and creates a system in which a shipment of hazardous secondary materials is more likely to be missed if it does not arrive at the recycler on time or at all.

Another practice to ensure control over hazardous secondary materials throughout a recycling or treatment process is the use of a tracking protocol. The Universal Hazardous Waste Manifest (EPA Form 8700-22) is the most obvious tracking system, but is only required for hazardous wastes. Other materials, which may not be hazardous wastes, can be tracked during shipment by Department of Transportation-required bills of lading, inventories, invoices, or other written communications.⁷⁹

Customized tracking protocols at a facility can come in the form of paper-intensive systems and inventories or computerized systems that use barcodes on labels and databases. Some facilities have elaborate internal tracking protocols that can quickly and easily locate any container that is at the facility. Bar code systems can also be used to perform daily inventories of all materials on site and to allow facility operators to locate anything that has been shipped to the facility.⁸⁰ This kind of tracking protocol adds an additional level of control for vendors and can make it easier to manage any inquiries made by generators concerned about their materials or by regulators seeking to verify compliance with regulations.

⁷⁵ Heritage Environmental Services, Conference call with EPA Office of Solid Waste, January 20, 2006.

⁷⁶ Heritage Environmental Services, Conference call with EPA Office of Solid Waste, January 20, 2006.

⁷⁷ United Technologies, Conference call with EPA Office of Solid Waste, February 6, 2006.

⁷⁸ Clean Harbors Environmental Services, January 11, 2006; DuPont, Conference call with EPA Office of Solid Waste, December 20, 2005.

⁷⁹ Bob Scarberry, General Electric, email to staff of EPA Office of Solid Waste, December 1, 2005.

⁸⁰ Heritage Environmental Services, Conference call with EPA Office of Solid Waste, January 20, 2006.

Due to environmental liability, it is in the generator's interest to ensure that its shipments reach their intended destination. For example, United Technologies explained that when they receive materials, they send a "letter of acknowledgement" that copies the names of the received materials from the bill of lading the generator filled out and thereby confirms receipt of the shipment of those materials.⁸¹ A few generators even require more detailed tracking and request that United send an exact accounting of the materials they received, not just the more general description from the bill of lading.⁸²

A related practice is the issuing of recycling certificates. Some recyclers issue certificates to generators to indicate when hazardous secondary materials have been recycled. A certificate of recycling can be issued when a generator successfully transfers materials to a recycler or after materials have been recycled. Although recycling certificates do not satisfy any regulatory requirements under RCRA or CERCLA, generators and recyclers sometimes use them for recordkeeping purposes. A recycler may issue a certificate to confirm when materials were accepted or recycled, the quantity of materials accepted or recycled, that materials were processed according to applicable state and federal regulations, the manner in which materials were recycled, or other relevant contractual business information, such as the cost of recycling.

The practice of issuing certificates appears to be most common in the electronics recycling industry. In that industry, recyclers market certificates of recycling to generators as an assurance that materials were in fact recycled. However, due to a mistaken perception that such certificates indicate a transfer of liability from the generator to a recycler, some state environmental agencies have chosen to publicize the fact that certificates do not have this effect. For example, the Georgia Department of Natural Resources provides guidance to generators of recyclable electronics which plainly states that certificates are simply a form of recordkeeping and that each recycler creates its own unique certificate.⁸³

Overall, it appears that as a result of CERCLA liability and of increased public and corporate awareness of the risks of recycling and disposal of hazardous secondary materials, responsible generators have in the past two decades become much more involved in the decisions relating to the final disposition or recycling of the materials they generated. This trend is visible especially among larger corporations with more resources to commit to auditing or to designing an EMS, but smaller companies that have made responsible management of hazardous secondary materials a priority are finding a way to increase their oversight of the recycling or disposal process as well.

⁸¹ United Technologies, Conference call with EPA Office of Solid Waste, February 6, 2006.

⁸² United Technologies, Conference call with EPA Office of Solid Waste, February 6, 2006.

⁸³ Georgia Department of Natural Resources, "What you should know about your e-scrap vendor," Georgia Department of Natural Resources Pollution Prevention Assistance Division web site, September, 2003, http://www.gadnr.org/p2ad/Assets/pdf_files/e-scrapvendor.pdf.

IV Assistance Available to Industry To Promote Responsible Recycling

Responsible generators and recyclers of hazardous secondary materials generally develop responsible recycling practices in response to particular business, environmental compliance, production, and stakeholder needs, and in accordance with various regulations. However, some organizations, such as trade associations, state environmental agencies, and EPA, offer support and guidance to industries to encourage responsible recycling. This section provides an overview of some forms of assistance which promote responsible recycling practices.

Trade Associations

Some trade associations that represent generators and recyclers of hazardous secondary materials help to promote responsible recycling practices among their member companies. In general, associations have developed programs to promote responsible recycling practices in response to economic, legal, and environmental concerns and in response to member companies' requests for assistance. Trade association initiatives that promote responsible recycling include developing recycling guidance; providing guidance on issuing certificates of recycling; establishing written guidelines for recycling; developing and supporting the use of environment, health, and safety practices that include recycling; creating environmental management systems that include recycling; and negotiating cooperative recycling agreements between trade associations.⁸⁴

Trade associations can help promote responsible recycling by providing easily accessible information to member companies and stakeholders about the benefits and regulatory issues associated with recycling, as well as technical information on how to recycle. One such source of information online is the lamp manufacturing segment of the National Electronics Manufacturers Association (NEMA).⁸⁵ The Web site is targeted at mercury lamp users, an important NEMA stakeholder group, and features links to state and federal regulatory information as well as a list of potential lamp recyclers. NEMA members, who produced the guidance, hope to encourage increased recycling among used lamp generators by making lamp recycling information comprehensive, easily accessible, and consolidated in one location.⁸⁶

As described in Section III, certificates of recycling are sometimes issued by recyclers of hazardous secondary materials as a means of confirming when a material has been received or recycled. The Reusable Industrial Packaging Association (RIPA), whose member companies include drum and intermediate bulk container (IBC) reconditioners, modified a traditional certificate of recycling to suit their industry. RIPA's "Empty Packaging Certificate" is used by generators to certify that their drums or IBCs are

⁸⁴ The overview of trade association resources is not comprehensive in scope. Due primarily to regulatory constraints and resource limitations, the information collected for this report section was found primarily through publicly available online resources and through limited discussions with trade associations.

⁸⁵ National Electrical Manufacturers Association, "What is Lamprecycle.org?" LampRecycling.org web site, <http://www.nema.org/lamprecycle/what.html>.

⁸⁶ National Electrical Manufacturers Association, "What is Lamprecycle.org?" LampRecycling.org web site, <http://www.nema.org/lamprecycle/what.html>.

properly emptied according to RCRA standards for empty containers prior to being sent to reconditioners. The certificate, which is used as a form of recordkeeping, serves two purposes: to document compliance with RCRA, CERCLA, and U.S. Department of Transportation regulations and to establish that drum reconditioning is occurring, and not disposal, which can require a RCRA permit.⁸⁷

RIPA's certificate of recycling is different from certificates previously discussed in Section III. Instead of certifying when recyclers have received or recycled generators' materials, generators or those emptying drums or containers certify that they are sending empty packaging to reconditioners. In theory, an Empty Packaging Certificate can be used by generators and reconditioners of drums and IBCs to record when the drums changed hands and the agreed upon condition in which they were received.

Some trade associations have developed recommended management practices that are designed to improve and standardize responsible recycling among member companies. These management practices include written codes of operations or management, EH&S programs, and EMSs. Associations can require participation by members or allow them to implement the practices voluntarily. The companies implementing the practices can benefit from improved environmental compliance, increased product quality, and possible financial savings. Another benefit is the outside perception that the company is committed to environmental protection.

Trade associations may also have written codes that outline members' expected commitments to responsible recycling. Codes can be voluntary or mandatory for members, can be specific to recycling or not, and often address both operations and management activities. For example, RIPA has developed a "Code of Operating Practice" for each form of reconditioning in which its members are involved (i.e., steel and plastic drums, and IBCs). Member companies are expected to adhere to the code, which includes standard operating procedures for reconditioning and EH&S practices. Generally, the drum and IBC codes cover how containers are received and in what condition; how containers are processed, remanufactured, or repaired; reasons for rejection of containers; and environmental and employee considerations such as compliance with regulations and proper training and protective equipment. By creating written codes for adoption by its member companies, RIPA uses its status as a trade association to set a floor for responsible reconditioning activities.

Industry-specific environmental, health, and safety practices can also be established by trade associations as management tools to encourage responsible recycling. However, unless all of a trade association's member companies are recyclers, EH&S practices are likely to include recycling activities but not be limited to them. The American Chemistry Council's (ACC) Responsible Care® Management System (RCMS) is one example of an association's EH&S, or environmental, health, safety, and security (EHS&S) practices. RCMS was created as a management tool for implementing ACC's

⁸⁷ Reusable Industrial Packaging Association, *Responsible Packaging Management*, 15. Landover, MD, Provided by Paul W. Rankin and C.L. Pettit, Reusable Industrial Packaging Association, February 15, 2006.

Responsible Care® Guiding Principles to which all member companies must subscribe. The key areas of RCMS that indirectly support responsible recycling include identifying and assessing risks (2.1); safely managing disposal of chemicals (3.2.2); working with contractors “to foster the safe use, transport and disposal of [chemicals]” (3.2.5); and “[reviewing] Responsible Care® performance of... contractors and third party providers, commensurate with risk, for use in qualification reviews” (4.5).⁸⁸ RCMS offers member companies a framework for managing all their EHS&S practices.

Another example is SOCMA’s ChemStewardsSM Program, which is quite similar to RCMS with respect to requiring participation by members, focusing on EHS&S practices, and including responsible recycling activities within EHS&S program objectives (in fact, SOCMA members can receive credit for participating in RCMS). However, the programs are different in how they are applied to member companies. ChemStewardsSM has a three-tiered structure designed to accommodate members’ resources and commitments to the program. Tier 1 is geared towards smaller member companies and is meant to establish which laws and regulations are applicable, design a plan for addressing them, and begin a management system to ensure compliance. Tier 2 is for larger companies with annual sales of more than twenty-five million dollars and is focused on enhanced performance of EHS&S activities beyond Tier 1. Finally, for members who meet certain requirements, Tier 3 requires participants to have a third-party verification process of their EHS&S programs. The three-tiered approach to ChemStewardsSM was designed to be flexible and to accommodate SOCMA’s diverse member companies.⁸⁹

Some companies have an EMS, which generally tend to encourage responsible recycling practices through continuous evaluation of recycling activities. Trade associations can also support and encourage development of EMSs by their members. For example, the Institute of Scrap Recycling Industries (ISRI) has established a voluntary EMS model, the “Recycling Industries’ Operating Standard” (RIOS), tailored for and made available to members in 2006. Aiming to achieve economies of scale for member companies, ISRI essentially combined ISO 14001, ISO 9001, and OSHA 18001 standards (i.e., environmental, quality, and safety standards) when developing RIOS. The new standards require significant managerial, worker, and time commitments, and would cost an ISRI member with one scrap yard \$2,000 for the initial purchase and \$975 as an annual maintenance fee (costs are higher for those with more than one yard and for those who are not ISRI members). In return, ISRI anticipates that use of RIOS will afford greater competitiveness to members through better and more efficient operations, will

⁸⁸ American Chemistry Council, *Responsible Care® Management System*, Revised March 9, 2005, Provided by Amy L. DuVall, American Chemistry Council, November 23, 2005; Amy DuVall, American Chemistry Council, email to staff of EPA Office of Solid Waste, November 23, 2005.

⁸⁹ Synthetic Organic Chemicals Manufacturing Association, “ChemStewardsSM – Program Tiers,” ChemStewards web site, <http://www.socma.org/chemstewards/participation.htm>; “FAQ About Implementing SOCMA’s ChemStewardsSM Initiative,” ChemStewards Web site, <http://www.socma.org/ChemStewards/FAQ.htm>.

increase EH&S stewardship, and will serve as a marketing advantage for members who choose to participate.⁹⁰

Cooperative agreements between trade associations can also result in programs for responsibly managing recyclable hazardous secondary materials. For example, RIPA and ISRI have a cooperative agreement that addresses recycling drums for their scrap metal value. RIPA estimates that member companies send between five and eleven percent of the “empty” steel drums they receive to scrap metal recyclers because they are unfit to be reconditioned. As a result, drums which contained hazardous secondary materials could pose regulatory burdens or environmental threats to ISRI scrap metal recyclers. Therefore, RIPA and ISRI established a cooperative agreement which specifies that drums must be cleaned by reconditioners before they are recycled as scrap.⁹¹ This kind of agreement can benefit both associations by clearly defining members’ roles and expectations, and presumably increases responsible recycling practices and reduces environmental and liability risk.

Another type of trade association involved with promoting responsible industrial recycling is the Auditing Roundtable. The Auditing Roundtable focuses on the development of EH&S auditing, training auditors, and advancing best practices for environmental auditing.⁹² The Auditing Roundtable holds annual conferences and has resources on its Web site to educate auditors to improve EH&S auditing throughout industry. They also published a set of auditing standards in 1994 that are used to evaluate audit programs and resources.⁹³

Many trade associations offer member companies technical support with regard to implementing responsible recycling practices. Such support varies greatly from one industry to another. Some associations direct their support towards recycling activities, while others focus mainly on broader programs for responsible materials management.

State Environmental Agencies

With a few exceptions, individual states implement and enforce the requirements of RCRA Subtitle C, including regulations that apply to the recycling of hazardous secondary materials. Although we did not do an exhaustive search of state-provided guidance to recyclers, it is clear that a number of state environmental agencies provide basic information about hazardous industrial material recycling, much of which is publicly available online. Much of this information addresses regulatory issues relevant to recycling, such as those pertaining to storage, handling, shipping, and financial assurance requirements. State-sponsored information of a more technical nature is not as

⁹⁰ Institute of Scrap Recycling Industries, Conference call with EPA Office of Solid Waste, December 15, 2005.

⁹¹ Reusable Industrial Packaging Association, Meeting with EPA Office of Solid Waste, Arlington, VA, February 15, 2006.

⁹² The Auditing Roundtable, “Our Vision/Mission,” The Auditing Roundtable web site, http://www.auditing-roundtable.org/fw/main/Our_Vision_Mission-175.html.

⁹³ The Auditing Roundtable, “About the Roundtable: Auditing Standards,” The Auditing Roundtable web site, http://www.auditing-roundtable.org/fw/main/Auditing_Standards-53.html.

common on state Web sites. We also noted that much of the online recycling information from state agencies primarily addresses certain categories of relatively common recyclable materials, such as used oil, electronics, and universal wastes (like lamps and batteries). In general, the most common types of materials available online from state agencies are directories of recyclers, basic general recycling guidelines (such as for small businesses), and guidance on selecting responsible recyclers.

States commonly post directories of recyclers online. The Web sites generally provide recyclers' contact information and the types of materials recyclers accept, usually with a disclaimer noting that the state does not endorse the recyclers. Recyclers listed can be local, operating only in a few counties, or can be national.⁹⁴ Some directories also identify intermediaries such as used oil transporters and materials brokers.⁹⁵ There is no standard format for states' hazardous secondary recycling directories.

Many states provide basic technical guides for recycling hazardous secondary materials. The guides can also include recycling best practices for small businesses. Typically state guidance explains recycling activities to generators in easily understood language. Like state directories, there is no standard format for this information and it tends to be general in scope. For example, California's Department of Toxic Substances Control features a one-page document with best management practices for treatment of cathode ray tubes (CRTs). It briefly highlights practices for storage, labeling, containment, employee training, and transportation.⁹⁶ Other recycling guides include some recycling-related regulatory and environmental information in addition to recommended management practices.⁹⁷

In a few cases, state agencies provide Web-based tools for evaluating the recycling of hazardous secondary materials. Some of these documents provide generators of recyclable materials with fundamental questions to consider in deciding whether to recycle and who should conduct the recycling. These questions help generators assess the practicability of recycling, the quality of recyclers, and the legal liabilities or risks

⁹⁴ California Integrated Waste Management Board, "California Waste Stream Profiles: Electronic Products," California Integrated Waste Management Board web site, <http://www.ciwmb.ca.gov/Profiles/Material/eWaste/default.asp?VW=JSELECT&MTYPE=eWaste>; Maine Department of Environmental Protection, "Bureau of Remediation and Waste Management Recycling site," Maine Department of Environmental Protection web site, <http://www.maine.gov/dep/rwm/recycle/index.htm>; Ohio Environmental Protection Agency, "Computer, Fluorescent Lamp and Ballast Recyclers," Ohio Environmental Protection Agency web site, <http://www.epa.state.oh.us/dhwm/pdf/comp.lamp.ballast.list.pdf>.

⁹⁵ Tennessee Department of Environment and Conservation, "Used Oil Transporters in Tennessee," Tennessee Department of Environment and Conservation web site, <http://www.state.tn.us/environment/swm/pdf/Procandtranslist.pdf>; Ohio Environmental Protection Agency, "Mercury Recyclers," Ohio Environmental Protection Agency web site, <http://www.epa.state.oh.us/opp/recyc/mercres.html>.

⁹⁶ County of San Diego, "Management of CRTs," California Department of Toxic Substances Control web site, http://www.dtsc.ca.gov/HazardousWaste/EWaste/upload/HWMP_CRTs_BMPs_SDCo.pdf.

⁹⁷ Missouri Department of Natural Resources, "Fluorescent Lamps," Missouri Department of Natural Resources web site, <http://dnr.mo.gov/pubs/pub24.pdf>.

involved. For instance, the Colorado Department of Public Health and Environment lists evaluation questions for electronics recycling that cover the following subjects:

- “Materials, Logistics, Contracts;”
- “How [End-of-Life] Equipment is Managed;”
- CRTs management;
- Auxiliary recycling; and
- General business management.⁹⁸

Similarly, Georgia’s Department of Natural Resources has an evaluation tool that is also directed at electronics recycling. It suggests that generators—

- Research recyclers;
- Interview recyclers with a standard list of questions;
- Conduct on-site audits of recycling facilities;
- “Follow the materials trail” to understand how recyclable materials are processed and managed; and
- Get references from past customers.⁹⁹

In addition, Washington State’s Department of Ecology has developed a tool for evaluating used oil recyclers that emphasizes three criteria: costs and services, compliance history, and liability concerns. This tool is unique in that it provides a “comparison table” by which individual recyclers can be rated according to the three criteria. The table is a subjective measurement tool for choosing recyclers and was designed for companies to use in their decision-making process.¹⁰⁰

Overall, states can play a valuable role in providing generators with practical resources and guidance on regulatory requirements that can encourage responsible recycling practices. State agencies are also in a good position to tailor guidance and other recycling resources to meet the needs of particular local industries or types of hazardous secondary materials of concern.

EPA

Recently, the Environmental Protection Agency has emphasized the electronics industry in its efforts to promote responsible recycling guidance. Since 2003, EPA has worked through its Plug-In To eCycling Program to provide recycling information to the

⁹⁸ Colorado Department of Public Health and Environment, “Questions for Facilities to Ask a Recycler or Broker of Unwanted Electronics Equipment,” Colorado Department of Public Health and the Environment web site, <http://www.cdphe.state.co.us/hm/electronics/businessquestionsforvendor.pdf>.

⁹⁹ Georgia Department of Natural Resources, “What you should know about your e-scrap vendor,” Georgia Department of Natural Resources Pollution Prevention Assistance Division web site., September, 2003, http://www.gadnr.org/p2ad/Assets/pdf_files/e-scrappvendor.pdf.

¹⁰⁰ Washington State Department of Ecology, “How to Choose a Hazardous Waste or Used Oil Contractor—A Help Guide: Commercial Recyclers and Hazardous Waste,” Washington State Department of Ecology web site, http://www.ecy.wa.gov/programs/hwtr/hwfacilities/web_guide/com_recyclers.html.

public, to facilitate stakeholder partnerships to increase safe recycling, and to create pilot projects for electronics collecting and recycling opportunities.¹⁰¹ Plug-In To eCycling has been successful in partnering with stakeholders to reuse and recycle electronics and in creating pilot projects to test innovative ways of recycling. This section of the report will focus on the EPA's guidance documents relevant to recycling of electronic wastes.

EPA's Plug-In To eCycling Program has produced two main products for generators of used electronic materials: a guide to electronics management and a checklist of questions to assist in evaluating recyclers. *Guidelines for Materials Management* contains a discussion of due diligence efforts that generators of used electronics that belong to Plug-In To eCycling should undertake before sending electronics to a facility. The guidelines call for a hierarchy-based approach to choosing waste management facilities where recycling, reuse, and refurbishment options may be environmentally preferred over landfilling or incineration. In addition, the guidelines urge generators to ensure that management facilities, including overseas facilities receiving exported electronics, are in compliance with applicable regulatory requirements.

Two types of electronics management involve specific due diligence efforts: reuse or refurbishment and recycling. The recycling guidance calls for oversight of "downstream" recycling facilities (e.g., smelters) that are involved in recycling. EPA suggests that due diligence efforts for generators of recyclable electronics ensure that recyclers have an EMS (or for smaller businesses, a risk management plan with ongoing EH&S assessment); substantial EH&S practices, including liability insurance for releases and accidents; ongoing documentation and monitoring of compliance measures and waste materials; and a fully funded closure plan as required by regulations.¹⁰² These due diligence guidelines were established to achieve greater protection of human health and the environment through responsible recycling practices.

The *Checklist for the Selection of Electronics Reuse and Recycling Services*, created by EPA and other federal agencies, is designed for generators of used electronics that are trying to choose a responsible recycler. Answers from checklist questions about recyclers can help generators decide if a recycler is compatible with their needs, complies with appropriate regulatory requirements, has adequate EH&S practices, thoroughly knows its downstream markets for recycled electronics and residuals, has sufficient financial closure requirements, and can confirm responses to questions through a verification process.¹⁰³ A generator using this checklist will have a more complete picture of recyclers' operations and potential liabilities, and should therefore be able to make a better informed decision when selecting a recycler.

¹⁰¹ U.S. Environmental Protection Agency, "Plug-In to eCycling," U.S. Environmental Protection Agency Plug-In to E-Cycling web site, <http://www.epa.gov/epaoswer/osw/consERVE/plugin/index.htm>.

¹⁰² U.S. Environmental Protection Agency, *Plug-In to eCycling: Guidelines for Materials Management*, U.S. Environmental Protection Agency web site, <http://www.epa.gov/epaoswer/osw/consERVE/plugin/pdf/guide.pdf>.

¹⁰³ Federal Electronics Challenge, "Checklist for the Selection of Electronics Reuse and Recycling Services: November 2003," Federal Electronics Challenge web site, <http://www.federalelectronicschallenge.net/resources/docs/select.pdf>.

Current efforts to promote responsible recycling of hazardous secondary materials vary greatly among industries and states, and are limited at the federal level. While trade associations have generally taken the lead in developing responsible recycling activities and information for members, some associations are more active than others in this area. The same is true among state environmental agencies: some states are considerably more active than others in promoting and providing information about responsible recycling. Outside the realm of electronics recycling, EPA provides little assistance for making these kinds of decisions regarding hazardous secondary materials recycling.

V Case Study: Due Diligence for Used Electronics

This case study examines how one particular sector of industry, the electronics industry, including both generators and recyclers of used electronics, approaches the materials management challenges discussed in this study. Electronics—computers, cellular telephones, personal digital assistants (PDAs), televisions—are pervasive in the marketplace and are made out-of-date relatively quickly by technological advances, making waste electronics (e-waste) one of the fastest growing wastes. However, high levels of public awareness due to recent media reports, uncertainty over the hazards of the components, and concern about the ultimate disposition of used electronics have led to due diligence on waste shipments being practiced by responsible members of industry.

Overall, the themes in the e-waste industry echo this study's findings about trends in recycling and management of hazardous secondary materials. Some electronics contain small amounts of one or more hazardous constituents, sometimes enough to make them hazardous wastes for regulatory purposes. For this and other reasons, the responsible elements of the electronics industry—manufacturers, generators, and recyclers—have embraced the concept of due diligence for recyclers of e-waste. A simple internet search reveals guidance to generators from federal and local governments, international bodies, and industry on how to perform due diligence on the entities to which they are sending e-waste.

Large generators of used electronics, such as businesses whose employees use computers, cell phones, and PDAs as a part of their jobs, could potentially have a waste problem on their hands in the event that their e-waste is not appropriately handled and recycled or disposed of. The due diligence practices that are often practiced by generators of e-waste are encouraged by Superfund liability concerns and other regulatory requirements, by a desire to ensure that companies' environmental goals and targets are met, and by the need to ensure protection from negative public relations in the area of materials management.

Like other hazardous secondary materials discussed above, improper disposal of waste electronics could lead to liability under Superfund. Generators of e-waste, like generators of other hazardous secondary materials discussed above, have to be aware of

their liability under Superfund.¹⁰⁴ When managing hazardous secondary materials, there is the risk that an individual being paid to take them may claim to recycle them safely and then either abandon them or recycle them in an environmentally irresponsible way. In an interview for *ComputerWorld*, Tod Arbogast, a senior manager of asset recovery services at Dell, warns generators to be aware of this practice when a vendor offers its disposal services below market costs: generators “need to be cognizant of what may be happening to these materials...and do due diligence on these vendors.”¹⁰⁵

Generators of e-waste may be more attuned to questions of Superfund liability because of the nature of their materials. Electronics are often easily traceable back to their owners through serial numbers on the machines and through asset tags with bar codes or other tracking systems on them.¹⁰⁶ In the event of an environmental problem, an inquiry would quickly identify the original generator of these wastes.

Different regulatory requirements also encourage a generator of e-waste to be confident about where materials go when they leave the generator’s control. California and other states have already enacted a ban on landfilling of e-waste.¹⁰⁷ The EU issued a directive in 2004 that holds manufacturers responsible for the end-of-life costs of the electronics they make.¹⁰⁸ By placing requirements on the end-of-life disposal of these wastes, these regulations require manufacturers and generators to take interest in what happens to the electronics once they are out of their hands.

Additional reasons may also drive concern for e-waste. Some corporate environmental plans include goals to recycle a certain amount of the e-waste the company generates or to ensure that e-waste is not sent to developing countries and/or prisons for recycling. Desire to meet these goals or concerns about a corporation’s environmental image may inspire due diligence and other environmentally responsible behaviors.¹⁰⁹

In a June 2003 article in *Recycling Today*, Lauren Roman advises that a company using an electronics recycler should evaluate it to “assure the company’s interests are

¹⁰⁴ Lauren Roman, “Creating an Electronics Recycling Program,” *Waste Age*, February 1, 2001. www.wasteage.com/mag/waste_creating_electronics_recycling/.

¹⁰⁵ Robert L. Mitchell, “Toxic Legacy,” *ComputerWorld*, February 2, 2004, <http://www.computerworld.com/hardwaretopics/hardware/story/0,10801,89552,00.html>.

¹⁰⁶ Robert L. Mitchell, “Toxic Legacy,” *ComputerWorld*, February 2, 2004, <http://www.computerworld.com/hardwaretopics/hardware/story/0,10801,89552,00.html>.

¹⁰⁷ Robert L. Mitchell, “Toxic Legacy,” *ComputerWorld*, February 2, 2004, <http://www.computerworld.com/hardwaretopics/hardware/story/0,10801,89552,00.html>.

¹⁰⁸ Robert L. Mitchell, “Toxic Legacy,” *ComputerWorld*, February 2, 2004, <http://www.computerworld.com/hardwaretopics/hardware/story/0,10801,89552,00.html>.

¹⁰⁹ The objections that have been raised to using prison labor for electronics recycling are (1) that recycling of electronics involves exposure to hazardous materials when there may not be adequate health and safety measures and (2) that the open recycling market can not compete with the low costs of prison labor, making it harder for free-market recycling enterprises to succeed. (Ted Sickinger, “Dell’s Call to Recycle Computers Draws Flak,” *The Oregonian*, April 18, 2003, http://www.ban.org/ban_news/dells_call_to_recycle_computers.html 1/6/2006).

protected against future...public relations headaches.”¹¹⁰ One such concern for some companies may have come from a June 2002 report issued by the Basel Action Network (BAN) and the Silicon Valley Toxics Coalition (SVTC). The report discusses the hazards of e-waste, describes where it originates and where it is sent, and contains pictures of electronics being mismanaged.¹¹¹ The BAN/SVTC report also pictures a close-up of several of the tags identifying the generators of the electronics photographed in the report.¹¹² The report received wide billing, prompting follow-up articles in national newspapers such as *The Washington Post*. Much of the information available to electronics users on due diligence discusses ensuring that the secondary materials are properly disposed of or recycled and are not sent to less developed countries where they might be mismanaged.

In an interview in the February 2004 *ComputerWorld* article on disposal of IT equipment, Frances O’Brien, an analyst for Gartner, a technology consulting firm, allowed that there are still many IT companies that do not embrace the importance of proper disposal of e-waste from a legal, technical, and social perspective, but also tried to express the importance of a company following up on its e-waste: “There are bad things happening. As a corporation, you need to prove you did due diligence.”¹¹³

A variety of organizations have published guidelines on product stewardship for electronics. Among those U.S. and international agencies and organizations that have published guidance on management of e-waste are—

- Plug-In to eCycling—EPA’s e-waste stewardship program;
- National Electronics Product Stewardship Initiative (NEPSI)—guidelines from this coalition of federal and state waste officials, and environmental and industry representatives;
- Organisation for Economic Co-Operation and Development (OECD)—guidelines from this group of thirty member countries with relationships with seventy other countries for environmentally sound management of wastes;
- The International Association of Electronics Recyclers (IAER)—standards developed by this trade association for electronics recyclers;
- The Institute of Scrap Recycling Industries (ISRI)—certification program managed by this trade association for scrap recyclers;
- Basel Action Network and the Silicon Valley Toxics Coalition (BAN/ SVTC)—voluntary pledge developed by these community activist groups.¹¹⁴

¹¹⁰ Lauren S. Roman, “Preventative Medicine,” *RecyclingToday*, June 2003, <http://www.recyclingtoday.com/articles/article.asp?ID=4798&IssueID=178>.

¹¹¹ Jim Puckett and others, “Exporting Harm: The High-Tech Trashing of Asia,” February 25, 2002, Prepared by The Basel Action Network and Silicon Valley Toxics Coalition, Basel Action Network web site, <http://www.ban.org/E-waste/technotrashfinalcomp.pdf>.

¹¹² Lauren S. Roman, “Preventative Medicine,” *RecyclingToday*, June 2003, <http://www.recyclingtoday.com/articles/article.asp?ID=4798&IssueID=178>.

¹¹³ Robert L. Mitchell, “Toxic Legacy,” *ComputerWorld*, February 2, 2004, <http://www.computerworld.com/hardwaretopics/hardware/story/0,10801,89552,00.html>.

¹¹⁴ Noranda Recycling, “Noranda Recycling: Environmentally Sound Management of End of Life Electronics,” Noranda Recycling web site,

In addition to the official guidelines that these groups have developed and published, other published articles provide additional guidelines for what kind of checks are reasonable and common for generators to do on companies collecting and recycling their e-waste. An article in *ComputerWorld* by the vice president of marketing for United Recycling in Chicago explains that audit forms for a permitted hazardous waste facility are not going to be appropriate for an electronics recycling facility. The article also states the importance of conducting a detailed audit on site at the facility and of a determination of standards required by the auditing organization. In connection with those decisions, the auditing organization must determine how far downstream in the recycling process they will audit to find out what happens to their materials after their initial processing.¹¹⁵

The variety of industry, government, and international guidelines and the discussions in the press of the value and the process of conducting due diligence demonstrate, in a broad sense, that due diligence activities are becoming more commonplace and expected in the electronics industry.

Overall, the recommendations on what kinds of things to address in an audit of an e-waste facility and on how to choose a recycler cover the entire recycling process starting with business agreements. For example, in addition to actually conducting a due diligence background check, *ComputerWorld* recommends to e-waste generators that they should address waste issues in their contracts with recycling vendors by including wording that prohibits the vendor or any subcontractors from exporting the e-waste to developing countries and that they require a fully documented audit trail for each item through final disposition.¹¹⁶ Generators are also regularly recommended to do a physical visit to the recycling site to verify any information in facility questionnaires or surveys. The most common inquiries discussed in the guidance for ensuring that a recycling vendor is responsible are similar to those discussed above as being asked by hazardous waste generators seeking assurance that their vendors are responsible recyclers.¹¹⁷

http://www.norandarecycling.com/documents/Noranda_Recycling_EOL_ESM.pdf; U.S. Environmental Protection Agency, "Existing Standards and Facility Evaluation Programs Related to E-Waste Recyclers," Robert Tonetti, Presentation at International Electronics Recycling Institute meeting, October 2005.

¹¹⁵ Lauren S. Roman, "Preventative Medicine," *RecyclingToday*, June 2003,

<http://www.recyclingtoday.com/articles/article.asp?ID=4798&IssueID=178>.

¹¹⁶ Robert L. Mitchell, "Sidebar: Nine Ways to Protect Yourself," *ComputerWorld*, February 2, 2004,

http://www.computerworld.com/hardwaretopics/hardware/story/0,10801,89553,00.html?from=story_packa

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¹¹⁷ Basel Action Network, "Electronic Recyclers Pledge of True Stewardship," Basel Action Network web site, http://www.ban.org/pledge/electronics_recycler_pledge.pdf; "Due Diligence Protocol: Request for Pre-Audit Information," *ComputerWorld* web site,

http://www.computerworld.com/computerworld/resources/files/environmental_quest.pdf; Federal Electronics Challenge, "Checklist for the Selection of Electronics Reuse and Recycling Services: November 2003," Federal Electronics Challenge web site,

<http://www.federalectronicchallenge.net/resources/docs/select.pdf>; Noranda Recycling, "10 Key

Questions to Ask your End of Life Electronics Recycler," Noranda Recycling web site, http://www.norandarecycling.com/environment/environmental_guidelines.htm; Noranda Recycling,

"Noranda Recycling: Environmentally Sound Management of End of Life Electronics," Noranda Recycling web site, http://www.norandarecycling.com/documents/Noranda_Recycling_EOL_ESM.pdf; Lauren S. Roman, "Preventative Medicine," *RecyclingToday*, June 2003,

- What are the operations and processes performed on site at the facility?
- Does the facility comply with all federal state and local regulations for environmental protection, worker safety, and transportation and does it have all the required permits and certifications?
- Does the facility have an environmental management system (EMS), an environmental risk management plan, a hazardous materials management plan, a closure plan, and a plan to ensure environmental compliance?
- Does the facility ensure responsible management of all materials they receive, including the final disposition (through recycling or treatment/disposal) of any residuals they generate or materials they send on to a third party? Does the facility send any materials to landfill or export materials to developing countries? Has the facility audited its third-party recycling/disposal vendors and its end markets?
- Can the facility show evidence of general liability, environmental liability, and other relevant insurance coverage as well as evidence that its subcontractors have relevant insurance coverage?

Due diligence practices in the electronics industry, illustrated in popular trade magazines and easily accessed guidelines for auditing, are an example of one particular industry's concerns about the issues discussed in this study and its approaches for addressing those concerns through some of the practices that are used throughout the hazardous secondary materials industry. The unique quality of e-waste can be taken into account through the flexibility of the general approaches available for managing these materials and ensuring they are responsibly managed as they move downstream from the original generator.

VI Conclusions

This qualitative study of current good practices for the responsible management of hazardous secondary materials has examined the incentives for responsible management of these materials and some of the principal practices employed by the industry responsible for managing them.

One consistent message appearing throughout the study was that the Superfund legislation was the original and main driver for developing standard procedures for auditing waste management facilities, for designing contracts that discuss the details of waste management, and for the adoption of other practices used by generators of hazardous secondary materials and the facilities to which they send them to minimize the chance of releases. The potential for future Superfund liability was an important factor in the widespread adoption of precautions for the management of hazardous secondary materials. In the twenty-six years since the passage of Superfund in 1980, there has also been increased interest in corporate responsibility programs and a growth in public

<http://www.recyclingtoday.com/articles/article.asp?ID=4798&IssueID=178>; Lauren Roman, "Creating an Electronics Recycling Program," *Waste Age*, February 1, 2001, www.wasteage.com/mag/waste_creating_electronics_recycling/.

interest in the environmental policies and programs of the companies they patronize and the facilities located in their communities. In addition, environmental management systems are a result of the movement to systemize environmental improvements in the same way as many companies were already systemizing quality improvements.

All of these incentives have led responsible generators of hazardous secondary materials and the facilities treating those materials to responsibly manage them in order to limit any potential for releases into the environment and thereby to limit subsequent damage to human health and the environment. These generators are in many cases also influenced by the presence of regulations and by any cost savings responsible management that may incur in the long term. Although these precautionary methods are not foolproof and are not universally adopted within the chain of management for all hazardous secondary materials, the structure that has emerged is generally one of responsible materials management.¹¹⁸

The study illustrates that throughout the universe of hazardous waste generators, responsible companies of various sizes have responded to these incentives and are trying various methods to ensure that their hazardous secondary materials are being managed in a responsible manner by an entity that has the capability to do so and the financial security to continue to do so into the future.

The study found that many permitted treatment, storage, and disposal facilities and recycling facilities are being audited to ensure their fitness to handle hazardous secondary materials. The audits range from modest to very thorough, usually depending on the size of the company generating the material. Although auditing is not standard procedure throughout industry, that smaller entities are undertaking these audits either on their own on a modest scale or through a trade association designed for auditing, like CHWMEG.

Auditing, together with practices like designing material specifications, issuing certificates of recycling, and developing tracking protocols, helps ensure that before a recycling facility or a treatment and disposal facility receives a hazardous secondary material from its customers, there is extensive communication between the generator and the receiving facility and that the materials are accounted for after they arrive. These are two key strategies for preventing spills or inadvertent disposal. The knowledge of a partner's facility that comes with the frequent auditing can cultivate trust at the same time as it safeguards against illegal disposal.

In summary, the methods discussed in this study demonstrate some of the techniques industry managing society's hazardous secondary materials has available for doing so responsibly and some of the reasons why they choose to employ them. Although this study is not an exhaustive look at these topics, EPA believes that it does provide a useful snapshot of some of the practices used by responsible companies to safeguard

¹¹⁸ Some cases that do not conform to this structure and potential causes for their nonconformance are examined in EPA's study on the environmental problems from recycling.

human health and the environment while, at the same time, increasing resource conservation through recycling and reclamation.

VII Appendix A: List of Items Found that May be Covered in an Audit of a Waste or Recycling Company¹¹⁹

Environmental, operational, and financial risk of the facility
Ultimate destination of wastes and recyclables
Facility ownership
Review of previous audits
Environmental setting of facility, especially geology, hydrology, topography
Site history, ownership history, and previous activity and/or contamination at that site
History of environmental compliance
 Compliance with substantive regulations
 Spill history indoors and out of doors
 Has the owner/ operator been a PRP at other sites?
Review of environmental monitoring requirements
Are permits up to date/ does facility have all required permits?
 Compliance with permit requirements
Facility design
Proximate activities
Upper management responsibility for environmental issues
General housekeeping practices
Presence of environmental management system
How arriving waste and secondary materials are transported?
Recordkeeping and tracking systems
Waste handling practices
Existence of written material handling procedures
Waste acceptance procedures (criteria, testing, rejections, receiving)

¹¹⁹ This list, though more thorough than that found earlier in the report, may still be an incomplete accounting of all items that may be covered. Items on this list were found in the following sources: Heritage Environmental Services, "Customer Audit Handbook," July 2005; King County, Washington, "Choosing a Vendor," Local Hazardous Waste Management Program in King County web site, <http://www.govlink.org/hazwaste/business/wastedirectory/choose.html>; Morley Kostecky and Richard Hart, "The Waste Facility Environmental Review Process," Western Canadian Auditing Roundtable web site, <http://www.wcar.org/text/articleEnvironmentalprocess.htm> (originally published in Hazardous Material Management Magazine, February/March 2000); New England Waste Management Officials Association, "How to Recycle Mercury in 8 Easy Steps," NEWMOA web site, http://www.newmoa.org/Newmoa/htdocs/prevention/mercury/lamprecycle/how_to_brochure.pdf; Bob Scarberry and Michele Anders, "Waste Management Facility Audits: The General Electric Experience and OECD Guidelines," Presentation at OECD Workshop on the Environmentally Sound Management of Recoverable Wastes (ESM), Cancun, Mexico, October 28-29, 1999; Trans-Cycle Industries, "Recycling Facility Audit Guidelines," Trans-Cycle Industries web site, <http://www.tci-pcb.com/audit.htm>; Washington State Department of Ecology, "How to Choose a Hazardous Waste or Used Oil Contractor—A Help Guide: Sample Checklist for Evaluation Costs, Services, Liability, and Compliance," Washington State Department of Ecology web site, http://www.ecy.wa.gov/programs/hwtr/hwfacilities/web_guide/checklist.html; Western Canadian Auditing Roundtable, "Waste Facility Environmental Review: New Version 3," Western Canadian Auditing Roundtable web site, <http://www.wcar.org/Framesets/ResourcesFrameset.htm>; Conference calls with EPA Office of Solid Waste: CHWMEG, Inc., November 17, 2005; Clean Harbors Environmental Services, January 11, 2006; DuPont, December 20, 2005; Gage Products, January 11, 2006; Heritage Environmental Services, January 20, 2006; Safety Kleen, January 31, 2006; United Technologies, February 6, 2006.

- Is unloading done inside or outside?
- What is the system for screening wastes prior to accepting them
 - Waste analysis and profiling & waste amount confirmation
 - Review of manifests and shipping documents and records management system
- What is the system for waste non-conformances?
- Storage before processing
 - How are materials handled and contained?
 - How long are materials stored?
 - What are procedures for releases and runoff?
 - Is there an impermeable layer beneath flooring for storage? What is the general condition of floors?
- Waste/ secondary material inventory system
- Processing
 - What monitoring is there?
 - Is capacity sufficient?
 - Determination of compatibility of waste with disposal/ treatment planned
 - How are personnel trained?
 - List and detailed description of all units on site (e.g., landfills, surface impoundments, thermal treatment, injection wells, waste storage)
 - Describe all processes; Are processes efficient?
 - What chemicals are used in recycling process?
 - Have there been any environmental contamination of soil due to operations?
 - What is the nature of overflow protection and alarms?
- What are procedures for release prevention and emergency management?
- Residuals management
 - How are emissions and residuals managed, stored and disposed?
 - List of off-site waste facilities used for further treatment or disposal
 - Are off-site facilities audited?
 - Does any other site receiving the waste from initial facility have all required permits?
- List of any closure/ post-closure requirements
- Product information (description, analysis, markets)
 - What are end uses of products?
- Safety and industrial hygiene practices
 - Recordkeeping
 - Review of OSHA compliance
- Review of ancillary operations
- Contingency plans
- SPCC plans
- Security on site
- Are facility and company financially sound?
 - Dun and Bradstreet
 - Annual reports
 - Financial assurance if TSDF– and a match of whether the financial assurance matches operations

Tax returns
Insurance Affairs
Amount of pollution liability/ environmental impairment insurance carried to cover spills, damages, or remediation
Amount of comprehensive general liability insurance carried
Worker's compensation
What mechanisms are there to ensure payment of clean-up costs if the facility suddenly goes out of business or for closure/ post-closure, if necessary? For example, a trust fund, an insurance policy, a letter of credit
Relationship with facility neighbors
Employee experience and training
Is medical monitoring in place?

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